Bell System
TECHNICAL REFERENCE

RECEIVE - ONLY DATASPEED®
PRINTER STATION
ARRANGEMENTS SYSTEM
INTERFACE SPECIFICATION

JANUARY 1970

Bell System Data Communications

TECHNICAL REFERENCE MANUAL

●

Receive-Only Dataspeed® Printer

Station Arrangements

System Interface Specification

●

January 1970

●

ENGINEERING DIRECTOR - DATA COMMUNICATIONS

NOTICE

This Technical Reference is specifically intended for the developers and designers of business machine data terminal equipments and devices which interface with Bell System data communications equipment and for technical consultants for use in designing data communications systems and arrangements employing Bell System data communications services and equipments. The right to revise this Technical Reference for any reason, such as conformity with USASI, EIA, CCITT or other standards, to utilize new advances in the state of the technical arts, or to reflect changes in the design of the equipment and/or service described herein is expressly reserved.

If further information is required, please contact:

Engineering Director — Data Communications
American Telephone and Telegraph Company
195 Broadway
New York, New York 10007

TABLE OF CONTENTS

LIST OF FIGURES

1. GENERAL

The Receive Only DATASPEED®Station uses a high speed nonimpact printing terminal, printing character-by-character (at line rate) with electronically controlled jets of ink. The DATASPEED Printer prints a maximum of 80 characters on a line, with an automatic line feed — carriage return after the 81st character. The unrestricted message format enables the printer to intermingle long and short printed lines without the use of "fill" characters.

The maximum operating speed of the terminal is 120 characters per second. Presently available station operating speeds are 120 or 105 CPS — serial, or up to 75 CPS — parallel. The DATASPEED Printer may be arranged for use with either the 5-level code or USA Standard Code for Information Interchange (USASX3.4-1968, 7 information bits, 1 parity bit). The serial station arrangement uses either a Data Set 202D with Data Auxiliary Set 804A or a Data Set 202C. The parallel station arrangement uses a Data Set 402D and Data Auxiliary Set 804A. Interface modification kits are available to provide page copy monitoring of a DATASPEED Type 2 or Type 5 Terminal .

2. COMMUNICATION SYSTEMS

2.1 General

Pictures of the Receive Only DATASPEED Printer Terminal and station arrangements are shown in Figures 1 and 2.

The Receive Only DATASPEED Printer Station is arranged to function with the USA Standard Code for Information Interchange (ASCII '68) (Figure 3). The 5-level code is also available (Figure 4). Of the 94 printable graphics (columns 2-7) the Receive Only DATASPEED Printer will print only 63 graphics (columns 2-5). An option is provided so that the lower case graphics (columns 6, 7) may be printed as upper case graphics (columns 4, 5). SPACE and DELETE are nontyping code combinations within the graphic code field.

The Receive Only DATASPEED Printer Station uses friction-feed paper 8-1/2 inches wide, in rolls having a maximum diameter of 5 inches. For additional information on friction-feed paper, refer to "Notes on Paper for Page-Type Friction-Feed Teletypewriters" obtainable through the Telephone Company representative.

Options are provided for operations of LF on LF, CR on CR, or LF/CR on LF;" no fill characters are required.

The Terminal Logic controls both the printer and the data set in either the attended or unattended mode of operation. The Terminal Logic signals the Printer to turn on its motors and enables data to flow only if the Printer indicates it is capable of copying data. If the Printer is not capable of copying the data, the Terminal Logic, through control signals, will indicate to the data set that it should not present data to be copied.

A Discrete Calling Generator is available to provide the Printer Terminal with the capability of generating a discrete code to enable an unattended Type 2 or Type 5 DATASPEED Sender equipped with a compatible recognizer.

2.2 Operator Controls (See Figure 5)

The operator controls are an array of lamps and keys which monitor and control various printer functions and options. The uses of the lamps and keys are listed below.

Position 1 — Break Lamp and Key: When this key is depressed, the Supervisory Channel Signal will be interrupted. The lamp will remain lit and the Supervisory Channel Signal will remain interrupted until the key is released.

Position 2 — Trans. Start Lamp and Key: When this key is depressed, the Discrete Calling Generator (DCG) will be activated. The lamp will remain lit until the DCG completes its cycle. If the printer is not equipped with the DCG option, nothing will happen when the key is depressed. The lamp will not light.

Position 3 — Printer On Lamp and Key: When the printer motor and the high voltage is turned on this lamp will light. Depressing this key enables the Interlock switch test circuit. If the lamp lights when this key is depressed, all interlocks are closed and there is paper available. If it does not light, the interlocks and the paper alarm circuitry should be checked.

Position 4 — Ready Lamp and Key: When the Ready Lamp is lit, all interlocks, the paper out alarm, and the over-voltage circuitry are in the ready state, that

is, the printer should be capable of turning on and receiving a message. Depressing this key will reset the over-voltage monitoring circuits.

Position 5 — Paper Advance Lamp and Key: When this key is depressed it will initiate a repetitive line feed action. This paper feed is set for 16 lines/sec. The lamp will remain lit while the key is depressed.

Position 6 — Low Paper Alarm Lamp: When a low paper condition exists, as monitored by the paper unwinder, this lamp will light. (Red)

A low paper condition will not cause a disconnect, but will prevent any subsequent incoming calls from being answered automatically. It also prevents the station from entering the data mode manually. A paper out or paper jam condition will drop a call and will not allow any subsequent incoming calls to be answered.

2.3 Interface

2.3.1 A detailed discussion of the characteristics of the interface connectors are covered in:

Bell System Data Communications
Technical Reference for Data Set Interface Connectors
July 1963

2.3.2 Lead Definitions — pin allocations

Following tables show DATASPEED Printer relations to Data Set leads. Specific Interface for a CPT application must be obtained from applicable Data Set Technical Reference.

2.3.2.1 Serial

Pin #	Identification	Abbreviation	Circuit	Category	Signals To and From Data Set
1	Protective GND	PG	AA	GND	————
2	Transmitted Data	TD	BA	Data	To
3	Received Data	RD	BB	Data	From
4	Request to Send	RTS	CA	Control	To
5	Clear to Send	CTS	CB	Control	From
6	Data Set Ready	DSR	CC	Control	From
7	Signal GND	SG	AB	GND	————
8	Data Carrier Detector	RLSD	CF	Control	From
9	)Reserved for Test				
10	)				
11	Secondary Request to Send	SRTS	SCA	Control	To
12	Secondary Received, Line Signal Detector	SDCD	SCF	Control	From
20	Data Terminal Ready	DTR	CD	Control	To
22	Ring Indicator	RI	CE	Control	From

Notation	Interchange Voltage	
	-25 to -5	+5 to +25
Binary State	1	0
Signal Condition	Marking	Spacing
Function	OFF	ON

2.3.2.2 Parallel

Pin #	Identification	Abbreviation	Comparable Circuit	Category	Signals To And From Data Set	
					Sending Station	Receiving Station
1	Protective Ground	PG	AA	GND	—┼—	
2	Data 1	D1		Data	To	From
3	Data 2	D2		"	To	From
4	Data 3	D3		"	To	From
5	Data 4	D4		"	To	From
6	Timing	T	DA/DD	Timing	To	From
7	Data 5	D5		Data	To	From
8	Data 6	D6		"	To	From
9	Data 7	D7		"	To	From
10	Data 8	D8		"	To	From
11	Signal Ground	SG	AB	GND	—┼—	
12	Timing Common	TC		Common	—┼—	
13	Interlock	IL	CC	Control	From	From
14	Remote Release	RR	CD	Control	To	To
15	Remote Operate	RO		Control	To	To
16	Secondary	SRTS/SDCD	SCA/SCF	Control	From	To
17	Ans. Back AB/TR Control	ABAB/T-R	–/CA	Control	From	To
18	Ans. Back A	ABA		Control	From	To
19	Ans. Back B	AAB		Control	From	To
20	Data, Trans./Rec.	TD/RD	BA/BB	Data	To	To
21	Carrier On	CO	CF	Control	————	From
22	Ring Indicator	RI	CE	Control	From	From
23	Out of Service	OS		Control	————	To
24	Control Comm/Grd	CC/CG		Comm/GRD	—┼—	

2.3.3 Interface Electrical Characteristics

2.3.3.1 Serial

Data Sets 202C and 202D interface conforms to the electrical characteristics contained in the EIA Standard RS-232A and will work with business machines that also conform to that specification. For specification summary see RS-232A.

2.3.3.2 Parallel

The customer-provided parallel sending terminal interface should be compatible with Data Set 402C.

3. SEQUENCE OF MANIPULATIONS FOR SERIAL DATA COMMUNICATION BETWEEN A CUSTOMER-PROVIDED TERMINAL WITH DATA SET AND A RECEIVE ONLY DATASPEED PRINTER STATION (ALL CIRCUITS ARE THOSE ASSOCIATED WITH THE CUSTOMER-PROVIDED SENDING TERMINAL AND ITS ASSOCIATED DATA SET)

The Receive Only DATASPEED Printer Station will operate in the Receive Only Mode as either an attended or unattended terminal; however, a 15-minute "ink warm-up" period is required after power is turned on the station to receive satisfactory copy.

3.1 An Attended Printer Station Calls an Attended or Unattended Remote Station (D.D.D. Network) (See Figures 6 and 7)

The operator of the printer station should insure that the Ready Lamp is lit and that the Low Paper Lamp is extinguished. The operator of the printer station manually initiates the call. If the remote terminal is attended, the operator should answer the call manually. The customer-provided equipment should present an "on" condition to circuit CD. The operator of the remote station should then depress the data key; this will present an "on" condition on circuit CC.

If the remote station is unattended, the data set should be left in the Auto Answer Mode. This may be permanently strapped in or selected with a key on the data set. To cause the data set to go off-hook, the customer-provided equipment must provide an "on" condition on circuit CD. This condition may be present before the call is initiated or it may respond to the "on" condition on circuit CE. When the data set goes off-hook, it will present an "on" condition on circuit CC.

When the operator of the remote station depresses the data key, or the remote station automatically answers, the circuit CC will present an "on". condition to the customer-provided equipment. At this time, the operator of the printer station will hear about 1.1 seconds of quiet followed by 3 to 5 seconds of 2025 Hertz tone. During this tone the operator of the printer station should depress the data key; this will cause the printer to turn on and secondary channel tone to be presented on the line. When the secondary channel is recognized, an "on" condition will be presented on circuit SCF to the customer-provided equipment. The customer provided equipment should present an "on" condition to the data set on circuit CA. This may be done immediately following the "on" condition on circuit CC or in response to the "on" condition on circuit SCF. The data set will respond with an "on" condition on circuit CB when it is capable of transmitting data. The customer-provided equipment should then proceed to send data.

3.2　　An Attended Remote Station Calls an Attended or Unattended Printer Station (D.D.D. Network) (See Figures 8 and 9)

If the printer station is attended, the operator should answer the call manually. The operator should insure that the Ready Lamp is lit and the Low Paper Lamp is extinguished. The operator of the printer station

should then depress the data key. This will cause the printer to turn on.

If the printer station is not attended and is equipped for automatic answer, it will automatically answer the call if the Ready Lamp is lit and the Low Paper Lamp is extinguished. When the call is answered, the printer will turn on automatically.

When the printer station is put into the data mode manually, or answers automatically, it will generate about 1 second of quiet followed by 3 to 5 seconds of 2025 Hz tone on the line. At the end of the 2025 Hz tone, a 387 Hz tone will be present, if supervisory channel is used. When the operator of the remote terminal hears the 2025 Hz tone she should depress the data key; this will cause the data set to provide an "on" condition on circuit CC. The customer-provided terminal should then provide an "on" condition on circuit CA and wait for an "on" condition on both circuit CB and SCF. At that time the customer-provided equipment may transmit data.

3.3　　A Remote Printer Station on a Dedicated Line (See Figures 10 and 11)

The printer will be turned on automatically when the customer-provided equipment presents an "on" condition to circuit CA. When the printer has turned on, it will turn on secondary channel. This will cause an "on" condition to be presented to the customer-provided equipment on circuit SCF. The customer-provided equipment should wait 500 milliseconds after seeing an "on" condition on both circuit CB and circuit SCF before transmitting data. If the printer is not ready or has a low paper condition, it will not turn on or reply with secondary channel.

3.4　　Disconnect (See Figure 18)

The call can be disconnected in two ways (D.D.D. Network):

1. If the stations are attended, the operators may revert to the Talk Mode and replace the handsets into the cradles.

2. If the remote station desires to disconnect automatically, the customer-provided equipment must present an "off" condition on circuit CD at least until it sees an "off" condition on circuit CC. The printer will turn off automatically after about a 15-second period of no carrier on the channel.

3.5 Break

The operator of the printer station may signal the remote station by depressing the break key. This will cause an "off" condition on circuit SCF to the customer-provided equipment as long as the break key is depressed.

3.6 Alarms

If the printer, being operated on switched plant, drops out of the Ready state, that is paper jam or paper out condition occurs, or the interlocks are opened, it will automatically drop the call. If it is being operated on a dedicated line it will cause an "off" condition to appear on circuit SCF at the remote station.

If the Low Paper Lamp is lit, the printer will not automatically answer a call or if it is in dedicated line operation it will not respond with an "on" condition on circuit SCF to the "on" condition being presented by the customer-provided equipment to the circuit CA. If Low Paper Light turns on during the course of a message, nothing will happen. However, once that message is completed and the printer turns off, it will not accept any further messages as discussed in the previous paragraph.

4. SEQUENCE OF MANIPULATIONS FOR PARALLEL DATA COMMUNICATIONS BETWEEN A CUSTOMER-PROVIDED TERMINAL WITH A DATA SET AND A RECEIVE ONLY DATASPEED PRINTER STATION (ALL CIRCUITS ARE THOSE ASSOCIATED WITH THE CUSTOMER-PROVIDED EQUIPMENT AND ITS ASSOCIATED DATA SET)

The Receive Only DATASPEED Printer Station includes the proper parallel data set. It will operate in the Receive Only Mode as either an attended or unattended terminal.

4.1 An Attended Printer Station Calls an Attended or Unattended Remote Station (D.D.D. Network) (See Figures 12 and 13)

The operator of the printer station should insure that the Ready Lamp is lit and the Low Paper Lamp is extinguished and then establish the call.

If the remote station is attended, the operator must manually answer the call and the RR lead must be connected to the data SG lead. The operator of the remote terminal should go to the Data Mode first; this will cause a closure between the IL and CC leads from the data set.

If the remote terminal is unattended, the customer-provided equipment must maintain a closure between the RR and SG leads and between the RO and SG leads, to allow the data set to go off-hook automatically. When the data set goes off-hook it will provide a closure between the IL and CC leads.

When the remote station is put in the Data Mode either by the operator depressing the data key or the automatic answering of the call, the operator of the printer station will hear about 1 second of quiet followed by 3 to 5 seconds of 2025 Hertz tone on the line. The operator of the printer station should depress the data key during this tone. This will cause the printer to turn on and put an "on" condition on the reverse channel. That is, the SDCD lead of the remote data set will be connected to the CC lead.

When the remote data set goes to the Data Mode and recognizes the closure on the SDCD lead, it should then close the TD lead to the SG lead. It should then provide a minimum of 200 milliseconds of spacing on all data leads. It then may proceed with the transmission of data. (Refer to the 402C Data Set Technical Reference for the timing relationship between the data and timing leads.)

4.2 An Attended Remote Station Calls an Attended or Unattended Printer Station (D.D.D. Network) (See Figures 14 and 15) .

The operator of the remote station should insure that the customer-provided equipment is ready to send data. The operator should then manually establish the call. The printer station must have the Ready Lamp lit and the Low Paper Lamp extinguished.

If the printer station is attended, the operator should answer the call in the Talk Mode and then go to data. If the printer station is unattended and is equipped for automatic answer, it will automatically answer the call. In either case the operator of the remote station will hear about 1 second of quiet followed by about 3 to 5 seconds of 2025 Hertz tone. At the end of this tone, the operator will hear a lower frequency tone. During the 2025 Hz tone the operator should go into the Data Mode. This will cause a closure between the

IL lead and the CC lead from the data set. The customer-provided equipment should wait for a closure between the SDCD lead and the CC lead, then present a closure between the TD lead and the SG lead. It should then present a spacing condition on all data leads for a minimum of 200 milliseconds and then proceed with the transmission of data.

4.3 A Remote Printer Station on a Dedicated Line (See Figures 16 and 17)

When the customer-provided equipment is ready to send data it should cause a closure between the TD lead and SG lead. The printer station will recognize this and turn the printer on and indicate a Ready condition to the customer-provided equipment by closing the SDCD lead to the CC lead. The customer-provided equipment should then provide a minimum of 50 milliseconds of spacing condition on all of the data leads. It should then proceed with the transmission of data.

4.4 Disconnect (See Figure 18)

The call can be disconnected in two ways (D.D.D. Network):

1. If the stations are attended, the operators may revert to the Talk Mode and replace the handsets into the cradles.

2. If the remote station desires to disconnect automatically, the customer-provided equipment must present an "open" condition between the RR lead and the SG lead at least until it sees an "open" condition between the IL lead and the CC lead. The printer station will then disconnect automatically after about a 15-second period of no carrier on the channel.

4.5 Break

The operator of the printer station may signal the remote station by depressing the break key. This will cause an "open" condition between the SDCD lead and the CC lead to the customer-provided equipment as long as the break key is depressed.

4.6 Alarms

If the printer being operated on switched plant drops out of the Ready state, that is a paper jam or paper out condition occurs, or the interlocks are opened, it will automatically drop the call. If it is being operated on a dedicated line, it will cause an "open" condition to appear between the SDCD lead and the CC lead at the remote station.

If the Low Paper Lamp is lit, the printer will neither automatically answer a DDD call nor will it respond with a closure between the SDCD and SG lead to a closure from the customer-provided equipment, between the TD lead and the SG lead. If low paper light turns on during the course of a message, nothing will happen. However, once that message is completed and the printer turns off, it will not accept any further messages, as discussed in the previous paragraph.

5. MISCELLANEOUS INFORMATION

5.1 Using the Printer to Monitor a Type 2 or Type 5 DATASPEED Station

If the printer is used to monitor a DATASPEED Paper Tape Station, the operating procedure will be the same as explained in the appropriate DATASPEED Technical Reference. The Interface Modification Kits given below should be used to provide this monitoring capability.

TP 325190 — Allows the Interconnection of the Printer and a Type 2 Paper Tape Receive Terminal

TP 325191 — Allows the Interconnection of the Printer and a Type 2 Paper Tape Send Terminal

TP 325192 — Allows the Interconnection of the Printer and a Type 2 Paper Tape Send-Receive Terminal

TP 325195 — Allows the Interconnection of the Printer and a Type 5 Paper Tape Send, Receive or Send-Receive Terminal

These Interface Modification Kits will allow the printer to monitor either the data transmitted or received or both depending upon the capabilities of the DATASPEED Paper Tape Terminal.

6. DATA FORMAT

6.1 Serial Transmission (See Figures 19 and 20)

Serial transmission is accomplished asynchronously using a 10-unit code. The first bit transmitted for each character is a start or spacing bit. The start bit is followed by the eight data bits. The last bit transmitted for each character is a stop or marking bit.

When using ASCII ('68), the first seven data bits are those shown for the character in Figure 3. The eighth data bit may be used for parity. When using the 5-level code, the first data bit is always spacing. The data bits two through six are the five bits for the character in Figure 4. The seventh and eighth data bits are always marking.

6.2   Parallel Transmission (See Figures 21 and 22)

Parallel transmission requires that all of the data bits for a character be presented, together with a timing signal, during the same time interval. The relationship between the data bits and the timing signal is explained in the Bell System Technical Reference for the data set being used.

When ASCII is being used, the seven data levels for a particular character, as shown in Figure 3, should be presented to data leads one through seven. The eighth data lead may be used for parity. If the 5-level code is used, the first, seventh and eighth data levels should be held spacing or open at all times. The five data levels for the particular character shown in Figure 4 should be presented to data leads two through six.

7.   POWER, ENVIRONMENTAL, AND PHYSICAL CHARACTERISTICS

Electric power is fed to the 2101 RO INKTRONIC* Printer via a 12-foot detachable 3-wire power cord connected to the back of the printer cabinet. If the data set is mounted outside of printer cabinet, the same A.C. power circuit should be used. (This is to minimize noise causing impulse potentials by using the same ground bus for all associated equipment.)

Input Voltage	105–130	V AC RMS
Frequency	60 ± 0.5	Hertz
Input Current (Steady State)	6.5	A AC
Input Current (Surge)	12.5	A AC
Power Consumption (Steady State)	780	Watts
Power Consumption (Surge)	1300	VA
Power Factor	.80 – .90	
Temperature (Storage)	–30 to +110	^{o}F
Temperature (Operating)	+40 to +110	^{o}F
Humidity (Storage & Operating)	10% to 95%	RH
Altitude	6500 feet (max.)	
Height	47-3/4 inches (W/O Paper Winder) 55 inches (W/Paper Winder)	
Width	18 inches	
Depth	27 inches	
Front Clearance (Door) (Slide Top)	16-3/8 inches 13-1/4 inches	
Rear Clearance	3 inches min. (Cabinet to Wall)	
Weight	300 pounds approximately	

* Trademark of Teletype Corporation
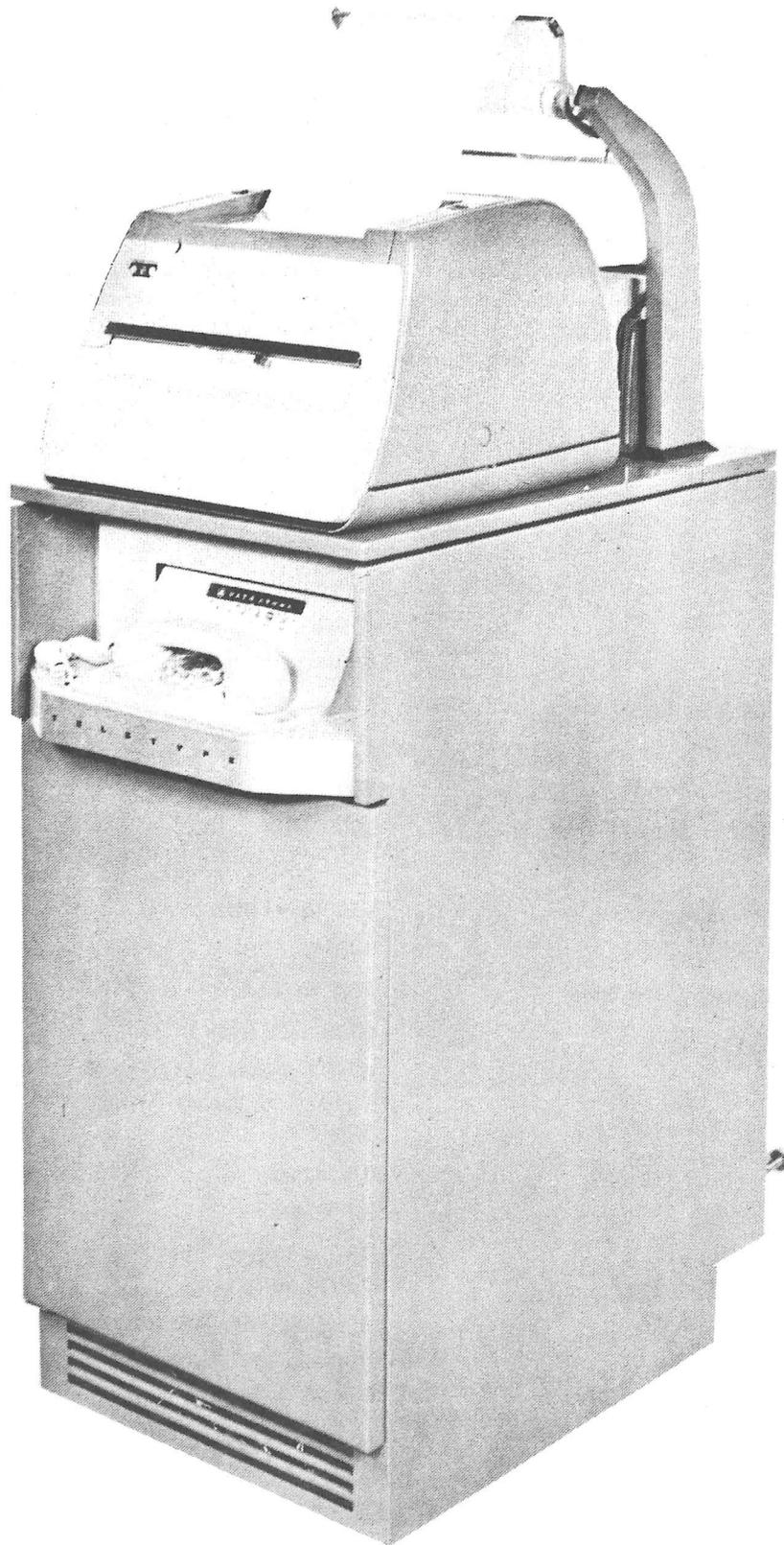
FIGURE 1 - RECEIVE ONLY DATASPEED PRINTER STATION WITH DATA SET
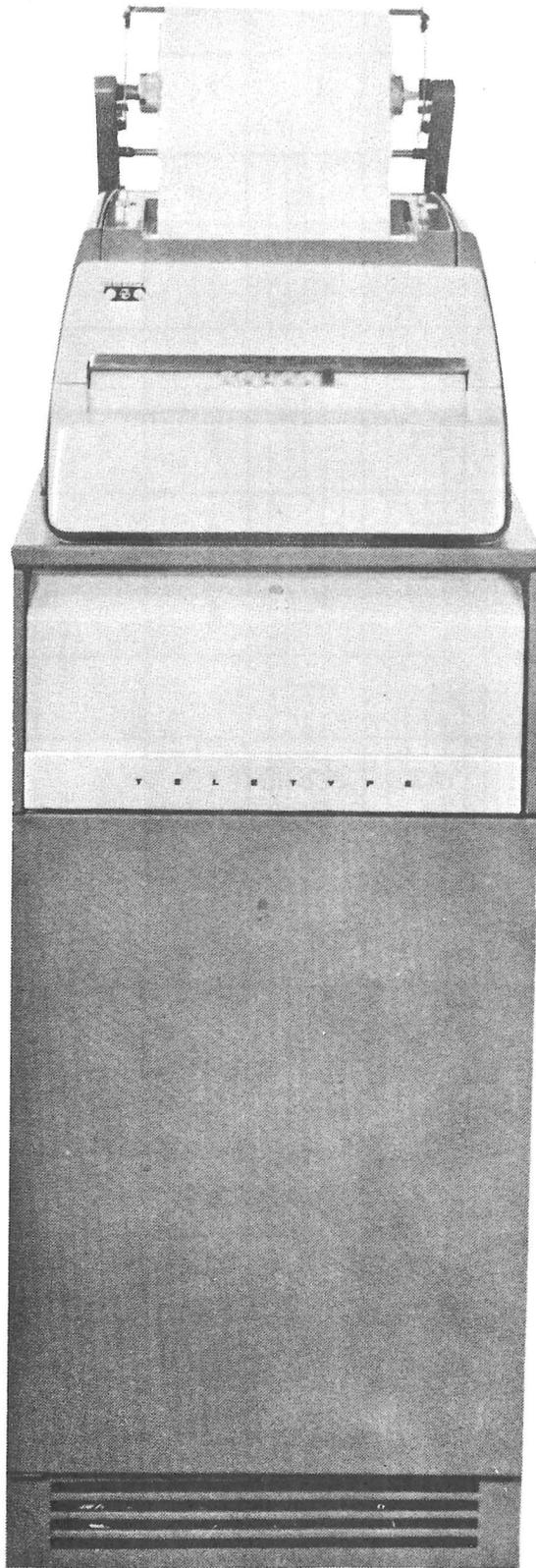
FIGURE 2 - RECEIVE ONLY DATASPEED PRINTER STATION WITH BLANK FRONT PANEL

FIGURE 3 - USAS X3.4 ASCII AND THE 2101 DATA TERMINAL CODE

				b7 b6 b5 →	0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
Bits b4	b3	b2	b1	Column / Row	0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE	SP	0	@	P		
0	0	0	1	1	SOH	DC1	!	1	A	Q		
0	0	1	0	2	STX	DC2	"	2	B	R		
0	0	1	1	3	ETX	DC3	#	3	C	S		
0	1	0	0	4	EOT	DC4	$	4	D	T		
0	1	0	1	5	ENQ	NAK	%	5	E	U		
0	1	1	0	6	ACK	SYN	&	6	F	V		
0	1	1	1	7	BEL	ETB	'	7	G	W		
1	0	0	0	8	BS	CAN	(	8	H	X		
1	0	0	1	9	HT / SP	EM	)	9	I	Y		
1	0	1	0	10	NL	SUB	*	:	J	Z		
1	0	1	1	11	VT / NL	ESC	+	;	K	[		
1	1	0	0	12	FF / NL	FS	,	<	L	\		
1	1	0	1	13	CR	GS	–	=	M	]		
1	1	1	0	14	SO	RS	.	>	N	⌒		
1	1	1	1	15	SI	US	/	?	O	—		DEL

Columns 4 and 6: FOLD OVER PRINTS CHARACTER OF COLUMN 4

Columns 5 and 7: FOLD OVER PRINTS CHARACTER OF COLUMN 5

Column 0 and 1

ASCII designations shown in lower left side of box.
Function performed by 2101 Data Terminal shown in upper right side of box.
Shaded Boxes: Upon receiving these codes the 2101 Data Terminal will be in a non-print - non-spacing mode.
_ Underscore may not be included in some early Stations.
NL may be field programmed for either New Line or Line Feed functions.

FIGURE 4 - 5-LEVEL CODE

		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	Letters	Figures	Space	Carr. Ret.	Line Feed	Blank
Figures		-	?	:	$	3	!	&	#	8	'	(	)	.	,	9	0	1	4		5	7	;	2	/	6	"						
Letters		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z						
	1	1	1	0	1	1	1	0	0	0	1	1	0	0	0	0	0	1	0	1	0	1	0	1	1	1	1	1	0	0	0	0	0
Information	2	1	0	1	0	0	0	1	0	1	1	1	1	0	0	0	1	1	1	0	0	1	1	1	0	0	0	1	1	0	0	1	0
Levels	3	0	0	1	0	0	1	0	1	1	0	1	0	1	1	0	1	1	0	1	0	1	1	0	1	0	1	1	0	1	0	0	0
	4	0	1	1	1	0	1	1	0	0	1	1	0	1	1	1	0	0	1	0	0	0	1	0	1	0	0	1	1	0	1	0	0
	5	0	1	0	0	0	0	1	1	0	0	0	1	1	0	1	1	1	0	0	1	0	1	1	1	1	1	1	1	0	0	0	0

-11-

BREAK TRANS PRINTER READY PAPER PAPER
START ON ADVANCE ALARM

FIGURE 5 - ¯OR CONTROLS
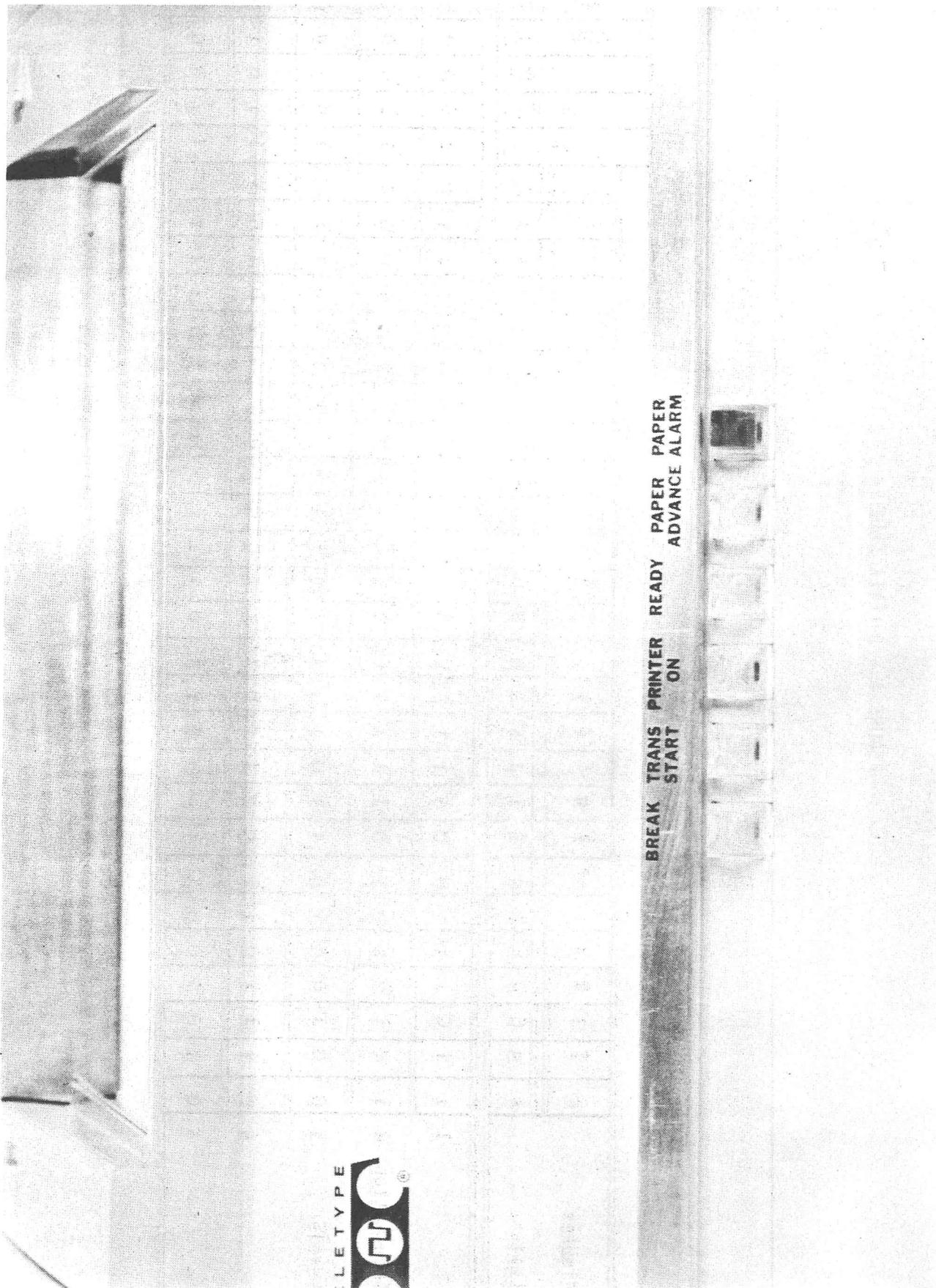
FIGURE 6 - SERIAL - ATTENDED PRINTER STATION
CALLS ATTENDED OR UNATTENDED REMOTE STATION

No → **Printer Ready?**

Yes ↓

Establish Call

↓

[ ] — Remote Data Set RI Lead (CE) ON

↓

Attended?

Yes → **Operator Answers & Goes To Data**

No ↓

Data Terminal Ready (CD)ON ?

Data Terminal Ready (CD)ON ? → No → **Drop Call**

Yes ↓

Go Off Hook

Yes ↓

[ ] — Return 2025 Hz. Tone and Data Set Ready (CC) ON Turn On Request to Send (CA)

↓

[ ] — Printer Station Goes To Data and Turns On Secondary Request To Send

↓

[ ] — Remote Station Wait For "ON" On Secondary Received Line Signal Detect (SCF) and Clear To Send (CB) and then Send Data

↓

Disconnect

FIGURE 7 - SERIAL ATTENDED PRINTER STATION CALLS AN
ATTENDED OR UNATTENDED REMOTE STATION
(TIMING BETWEEN REMOTE TERMINAL AND DATA SET)

Ring Indicator and Bell (CE)

Data Terminal Ready
To Data Set (CD)

Data Set Ready (CC) ON
If Data Set Auto-Answers
Or If It Is Manually
Answered And Then Put
Into Data Mode - From
Data Set

Turn On Request To Send (CA)
To Data Set

Receive Clear To Send (CB) After
Answerback Tone From Data Set

Receive Secondary Channel (SCF) From
Data Set If Used

Transmit Data On Send Data Lead

Call Initiation | Data Transmission | Disconnect*

* To Disconnect Turn Off Data Terminal Ready (CD) Until Data Set Ready Turns Off.

- 14 -

FIGURE 8 – SERIAL – ATTENDED REMOTE STATION CALLS AN
ATTENDED OR UNATTENDED PRINTER STATION

Remote Station Ready –
–Data Terminal Ready (CD) ON?

No

Yes

Establish Call

Printer Station Rings

Attended? — Yes → Operator Answers

No

Printer Station Ready?

No

Yes

Go Off Hook

Printer Station Ready? — No → Drop Call

Yes

Return 2025 Hz. Tone Turn On Secondary Channel

Remote Operator Hears 2025 Hz.
– and Goes To Data
Data Set Ready (CC) Turns On
Terminal Turns On Request to Send (CA)

Wait For Clear to Send (CB) and
– Secondary Received Line Signal
Detector (SCF) To Turn On Then
Send Message

Disconnect

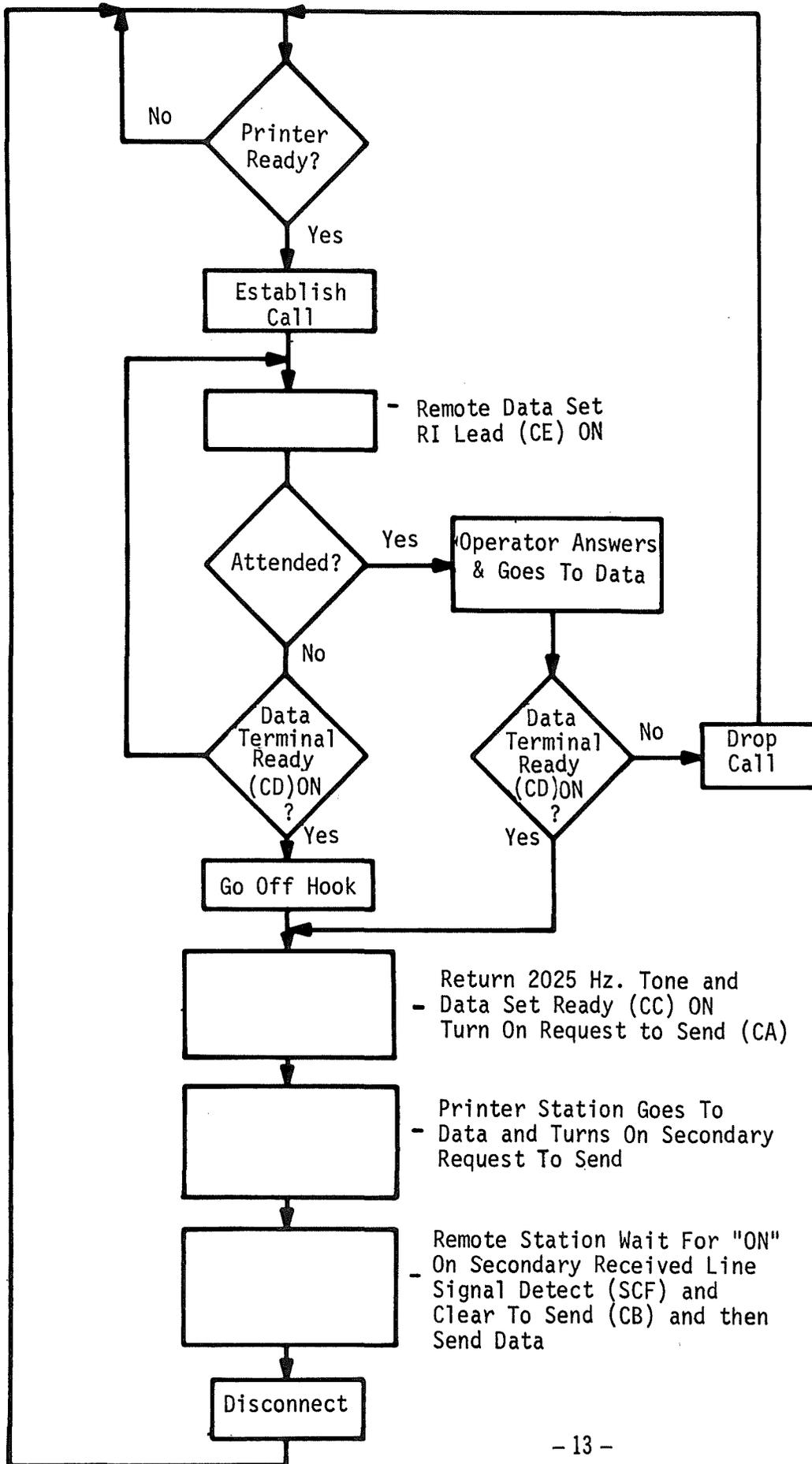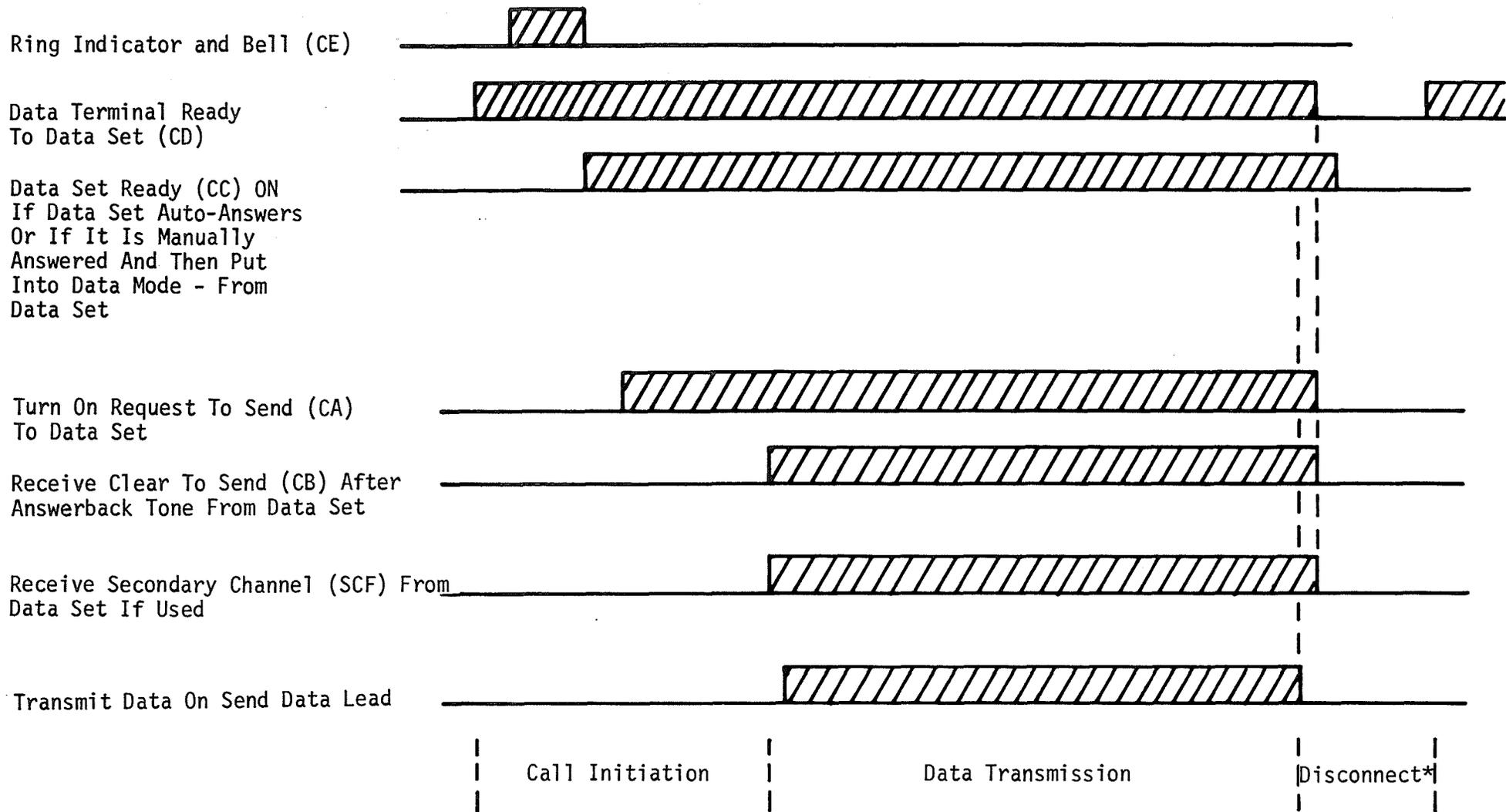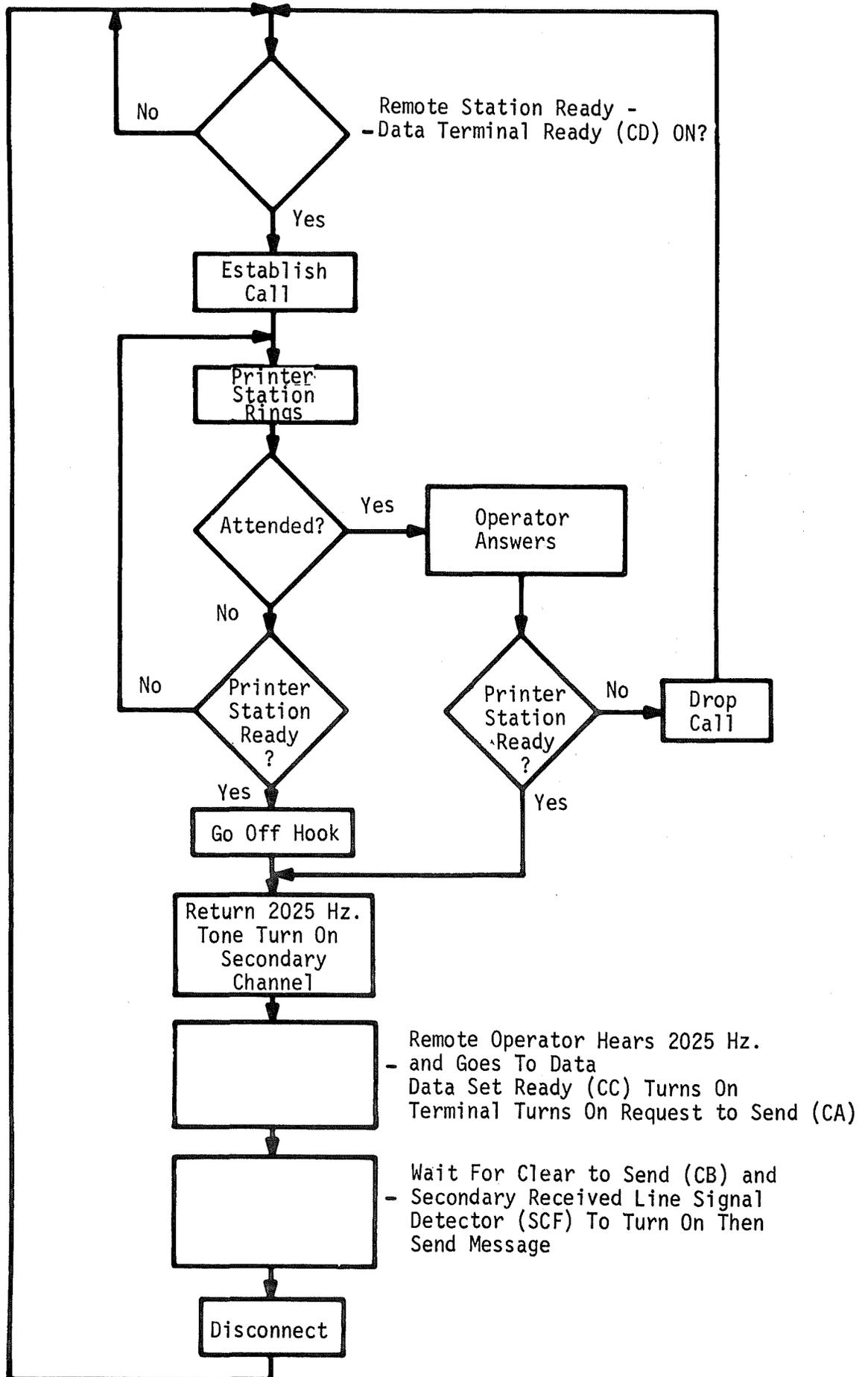FIGURE 9 - SERIAL ATTENDED REMOTE STATION CALLS
ATTENDED OR UNATTENDED PRINTER STATION
(TIMING BETWEEN REMOTE TERMINAL AND DATA SET)
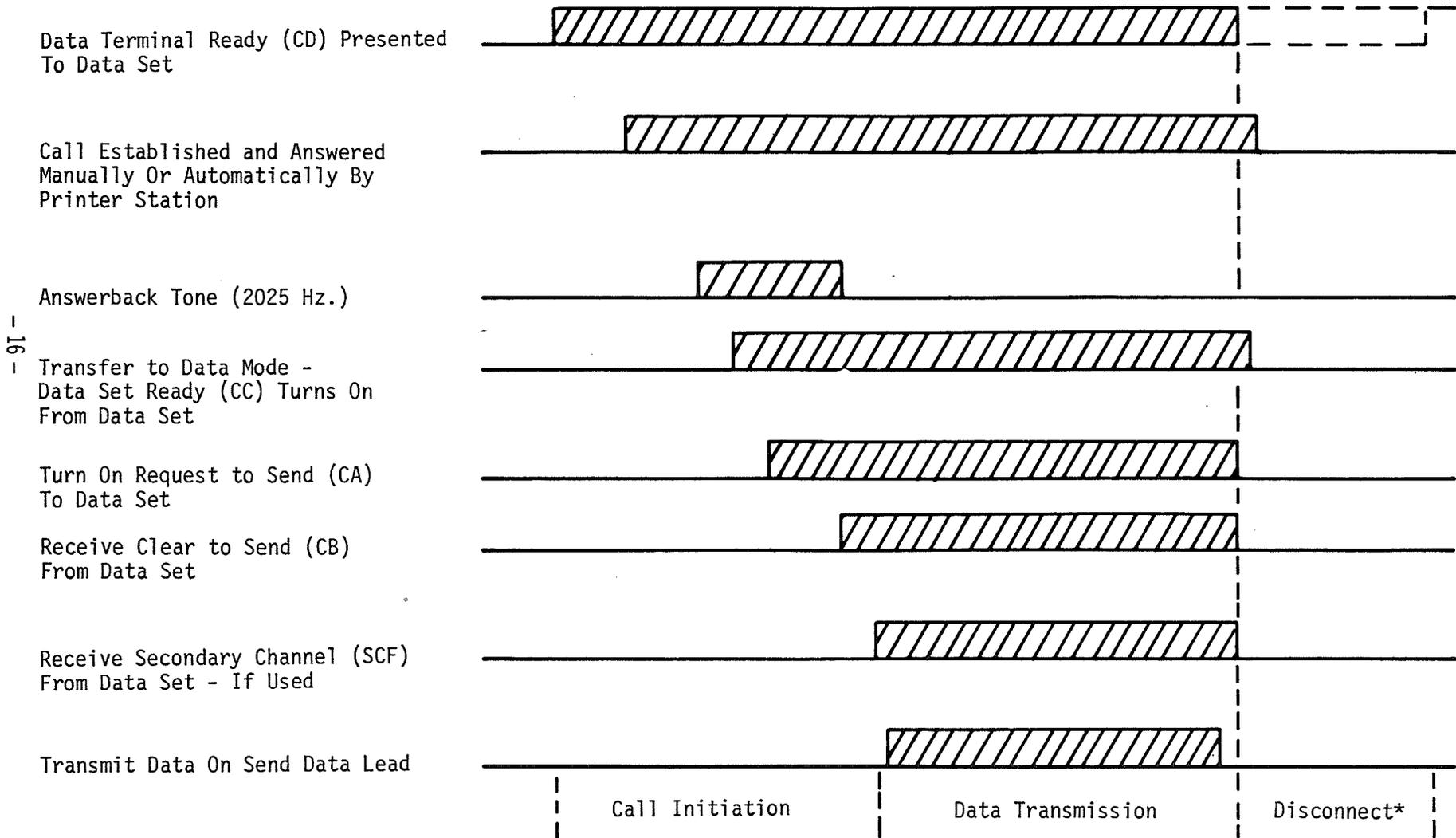
* To Disconnect Turn Off Data Terminal Ready (CD) Until Data Set Ready Turns
  Off Or Return To The Talk Mode and Lift and Replace Handset.

FIGURE 10 - SERIAL DEDICATED LINE OPERATION

Turn On?

No

Yes

Turn On
Request to
Send (CA)

Clear to
Send(CB)
Turns On

Printer
Ready?

No

Yes

Turn On
Printer and
Secondary
Channel

Secondary Received Line
Signal Detector (SCF)
Turns On

Send
Message

Turn Off Request to Send (CA)
Clear to Send (CB) and
Secondary Received Line
Signal Detector (SCF) Turn Off
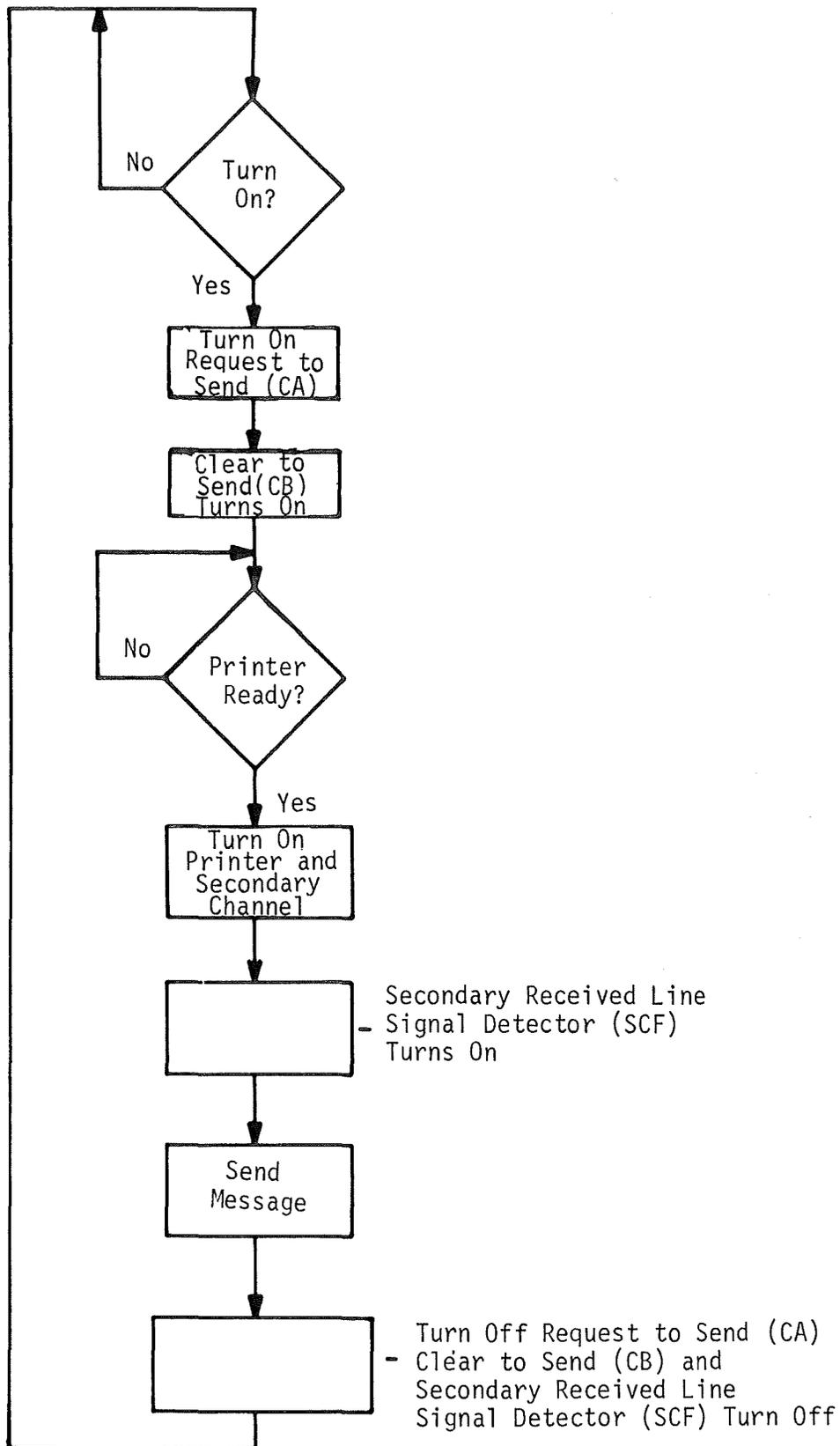
FIGURE 11 - SERIAL DEDICATED LINE OPERATION

(TIMING BETWEEN REMOTE TERMINAL AND DATA SET)

Turn On Request to Send (CA)
To Data Set

Receive Clear to Send (CB)
From Data Set

Receive Supervisory Channel
(SCF) From Data Set -
If Used

Transmit Data On The Send
Data Lead

FIGURE 12 - PARALLEL - ATTENDED PRINTER STATION CALLS
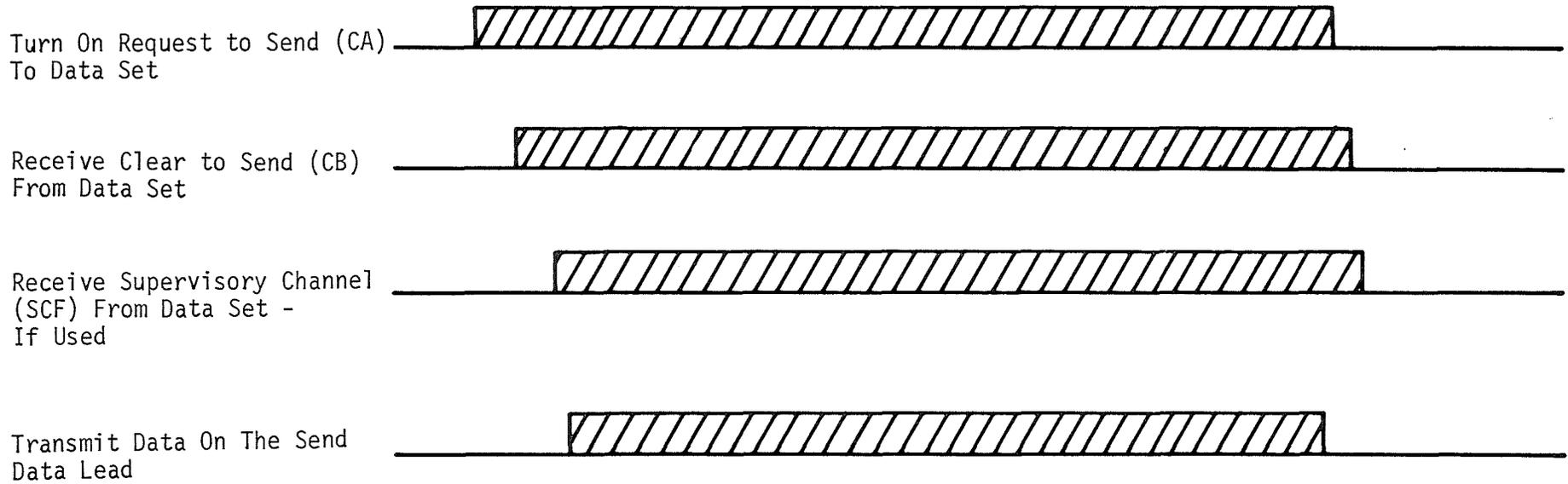AN ATTENDED OR UNATTENDED REMOTE STATION

FIGURE 13 - PARALLEL - ATTENDED PRINTER STATION CALLS AN
ATTENDED OR UNATTENDED REMOTE STATION
(TIMING BETWEEN REMOTE TERMINAL AND DATA SET)

Ring Indicator and Bell (RI)

Remote Operate (RO) and
Remote Release (RR) Closed
To Signal Ground (SG) by
Terminal

Interlock (IL) Closed to
Control Common (CC) By Data
Set - If Data Set Auto-Answers
Or If It Is Manually Answered
and Then Put Into Data Mode -

Close Send Data (TD) to Signal
Ground (SG) By Terminal

Closure Between Supervisory
Channel (SDCD) and Control
Common (CC) From Data Set -
If Used

Transmit Data On Eight Data
Leads and Timing

Call
Initiation

200 ms
All
Space

Data

Disconnect

* To Disconnect Open Remote Release From Signal Ground Until Interlock
  Opens From Control Common.

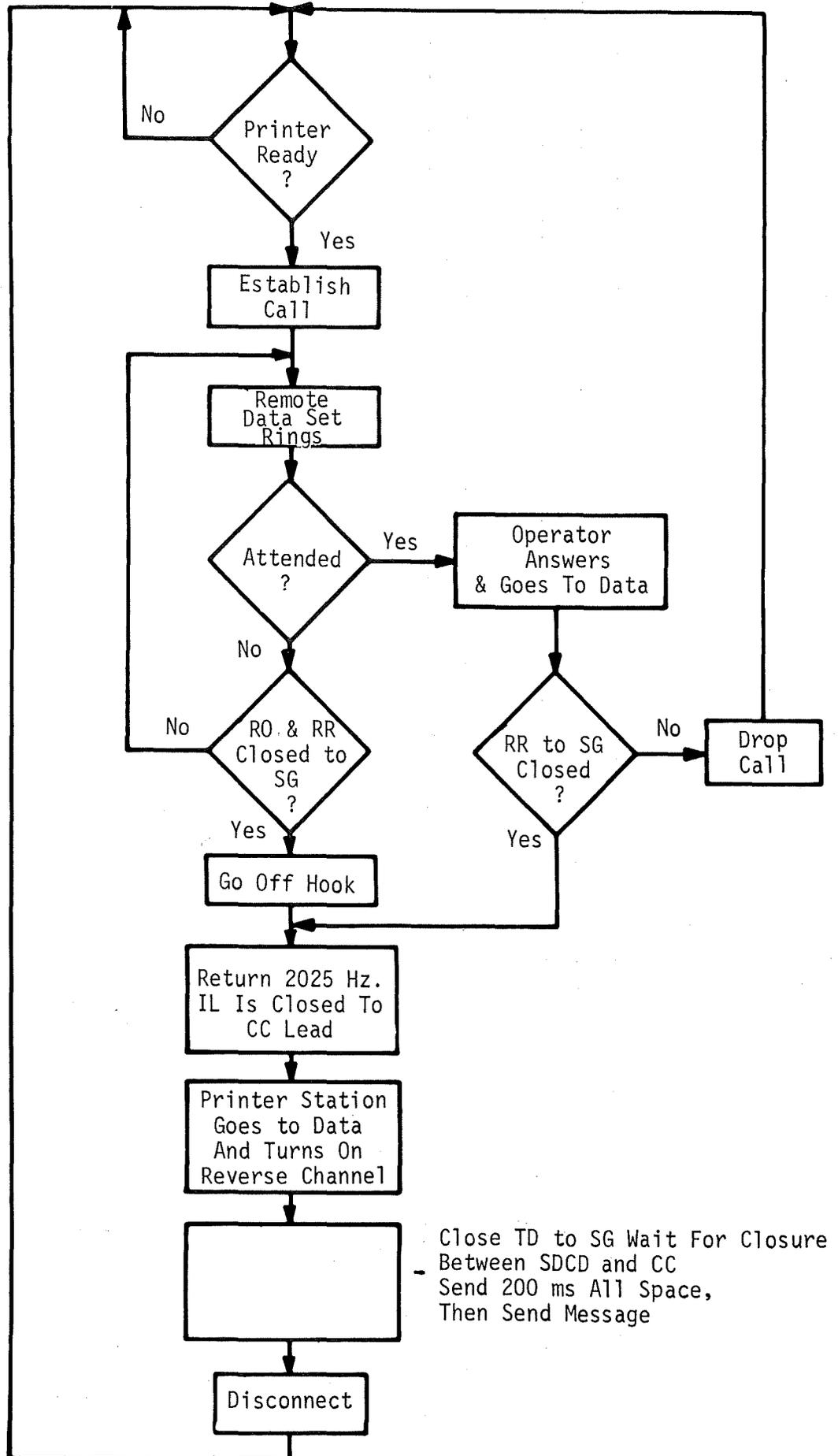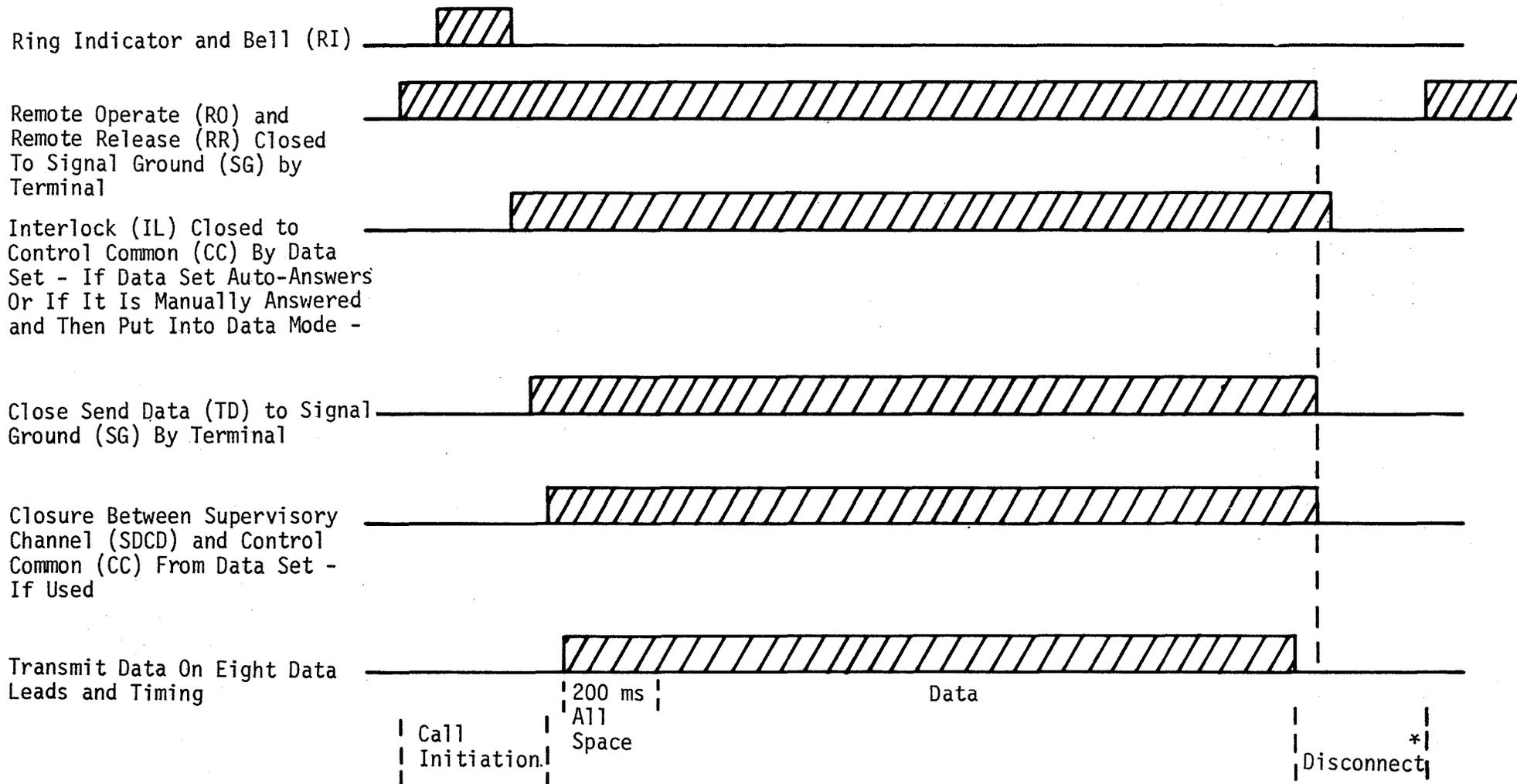# FIGURE 14 - PARALLEL - ATTENDED REMOTE STATION CALLS AN ATTENDED OR UNATTENDED PRINTER STATION
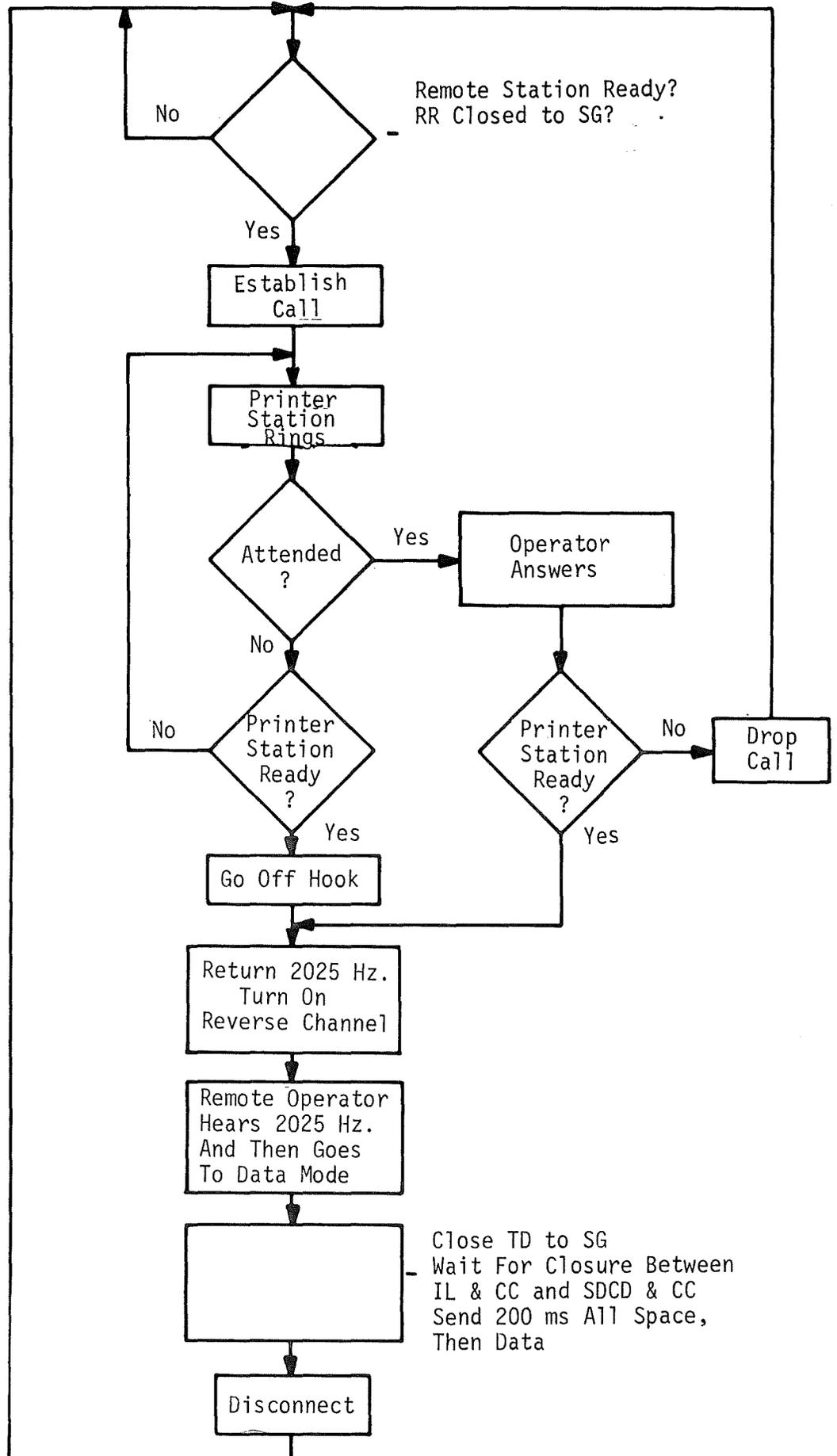
FIGURE 15 - PARALLEL - ATTENDED REMOTE STATION CALLS
AN ATTENDED OR UNATTENDED PRINTER STATION
(TIMING BETWEEN REMOTE TERMINAL AND DATA SET)

Remote Operate (RO) and Remote Release (RR) Closed To Signal Ground (SG) By Terminal

Call Established And Answered Manually Or Automatically By Printer Station

Answerback Tone

Transfer To Data Mode - Data Set Closes Interlock (IL) To Control Common (CC)

Terminal Closes Send Data (TD) To Signal Ground (SG)

Data Set Closes Supervisory Channel (SDCD) To Control Common (CC) - If Used

Transmit Data On 8 Data Leads And Timing

Call Initiation | 200 ms All Space | Data Data Transmission | Disconnect*
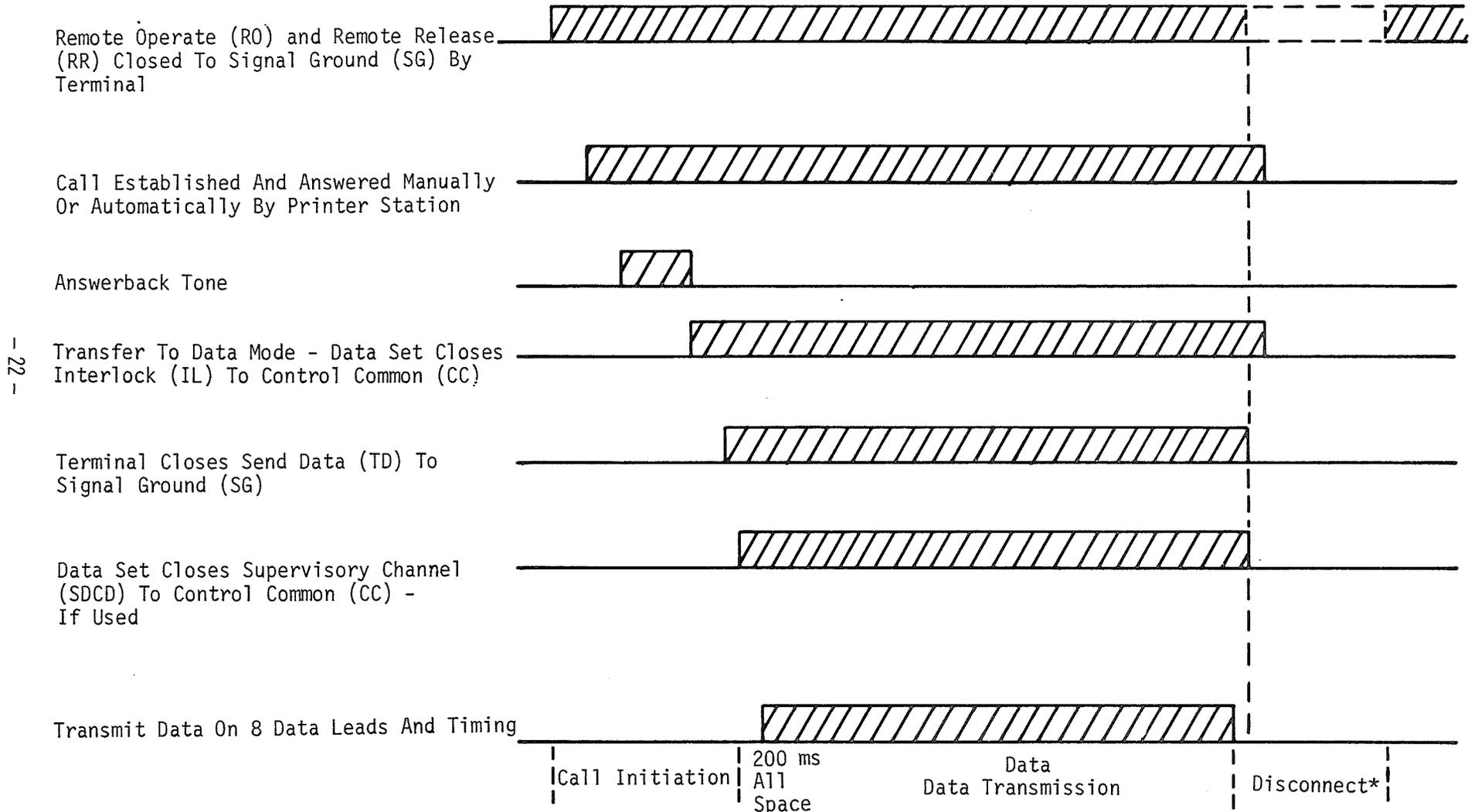
* To Disconnect Open Remote Release From Signal Ground Until Interlock
  Opens From Control Common Or Return To The Talk Mode, Lift And Replace
  Handset.

- 22 -

FIGURE 16 - PARALLEL DEDICATED LINE OPERATION

Printer Turns On
And Presents
Reverse Channel

Wait For Closure
Between SDCD and CC.
Send 50 ms All Space
Then Data
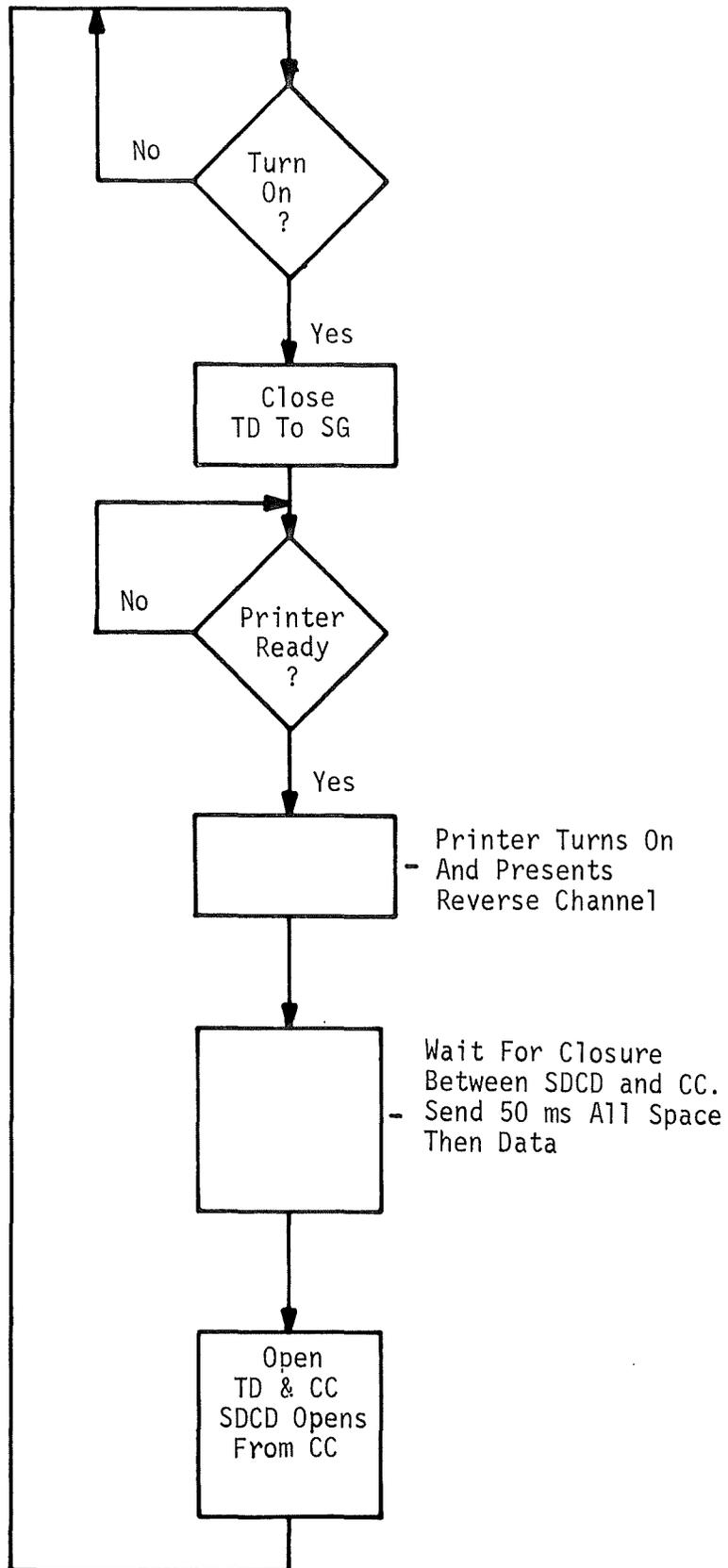
FIGURE 17 - PARALLEL - DEDICATED LINE OPERATION

(TIMING BETWEEN REMOTE TERMINAL AND DATA SET)

Send Data (TD) Closed To Signal
Ground (SG) By Terminal

Data Set Closes Supervisory Channel
(SDCD) To Control Common (CC)
If Used

Transmit Data On 8 Data Leads
And Timing

200 ms
All
Space

Data
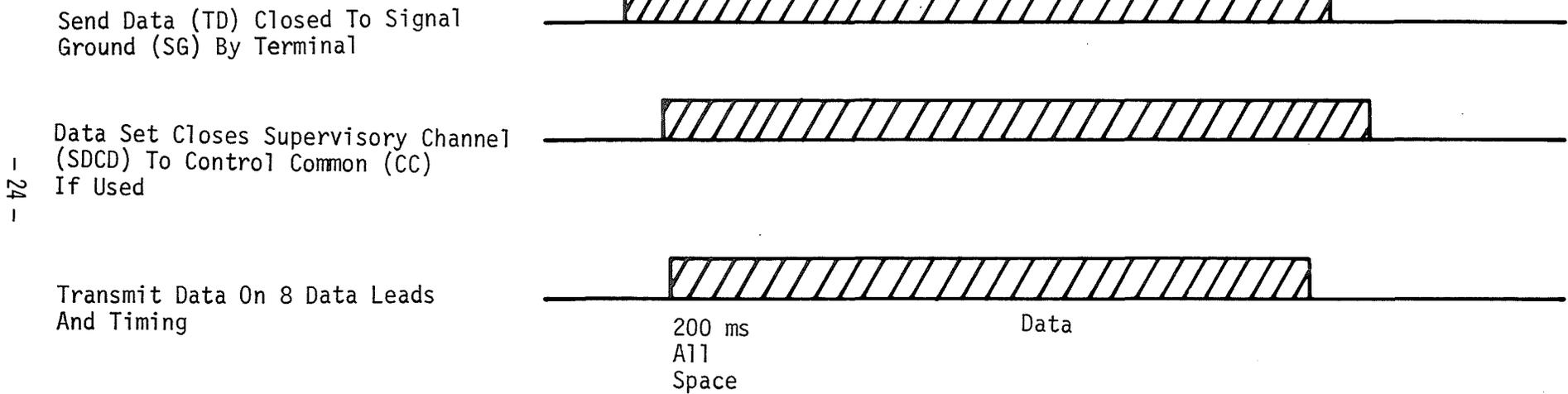
FIGURE 18   SERIAL DISCONNECT

FIGURE 18A   PARALLEL DISCONNECT

REMOTE INITIATED

```
OPEN RR          NO    ╱ ATTENDED ╲    YES    GO TO
FROM SG    ◀─────────  ╲    ?     ╱  ────────▶  TALK
                        ╲        ╱
   │                        ▲                      │
   ▼                        │                      ▼
IL OPENS                    │                   LIFT
FROM CC                     │                   AND REPLACE
                            │                   HANDSET
   │                        │                      │
   ▼                        │                      ▼
15 SEC.                     │                   15  SEC.
PRINTER                     │                   PRINTER
TURNS OFF ──────────────────┴────────────────── TURNS OFF
```

- 26 -

PRINTER INITIATED

```
AUTO                                            GO TO
DIS-      ◀──────────────────▲──────────────▶   TALK
CONNECT                      │
   │                         │                     │
   ▼                         │                     ▼
CALL                         │                   LIFT
DROPPED                      │                   AND REPLACE
                             │                   HANDSET
   │                         │                     │
   ▼                         │                     ▼
SDCD OPENS                   │                   CALL
FROM CC                      │                   DROPPED
IL WILL OPEN                 │                     │
FROM CC IF                   │                     ▼
DATA SET                     │                   SDCD OPENS
GOES ON                      │                   FROM CC
HOOK                         │                   IL WILL OPEN
   │                         │                   FROM CC IF
   │                         │                   DATA SET
   └─────────────────────────┴───────────────── GOES ON
                                                 HOOK
```
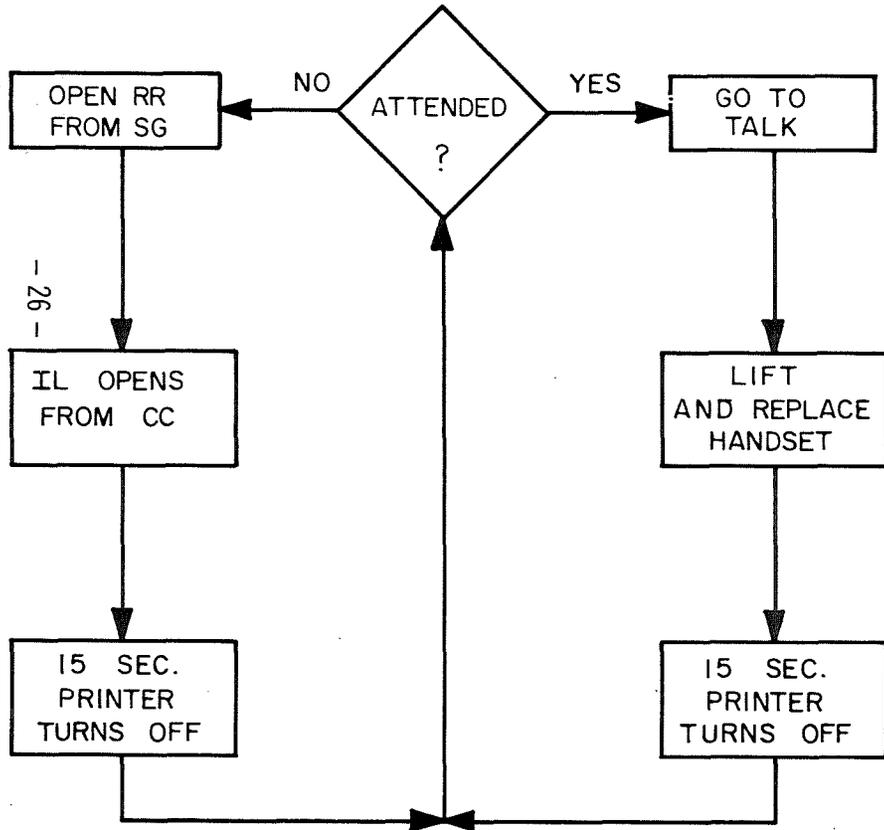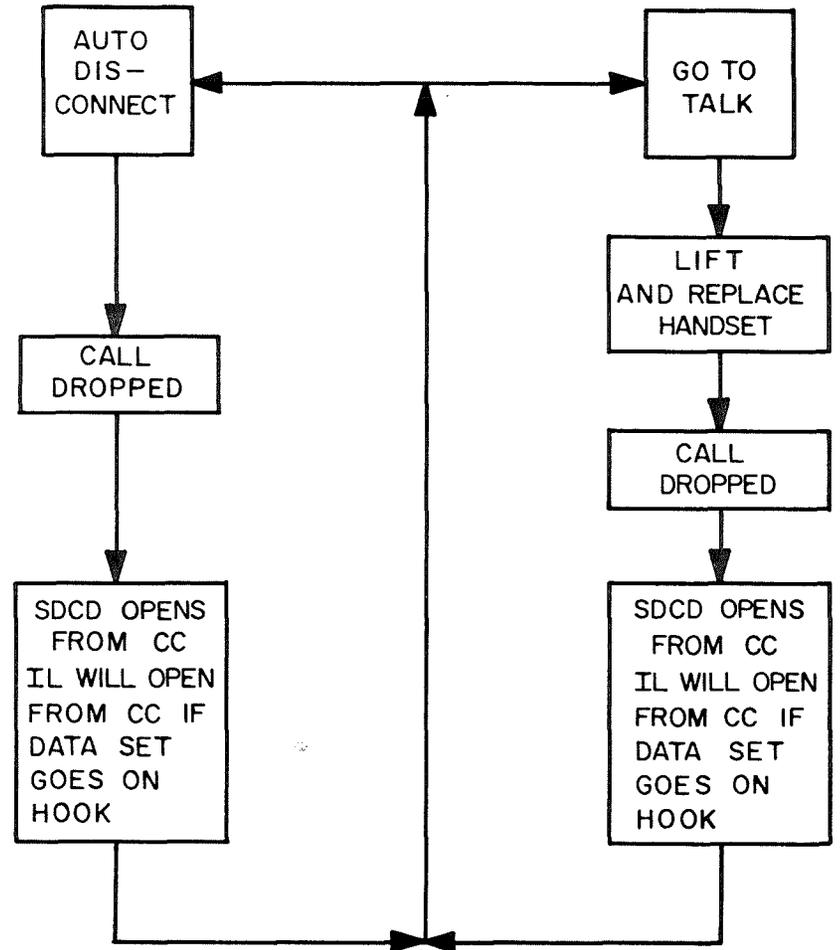
FIGURE 19   SERIAL TRANSMISSION – ASCII

SPACE

| START | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | STOP |

MARK

8 DATA LEVELS
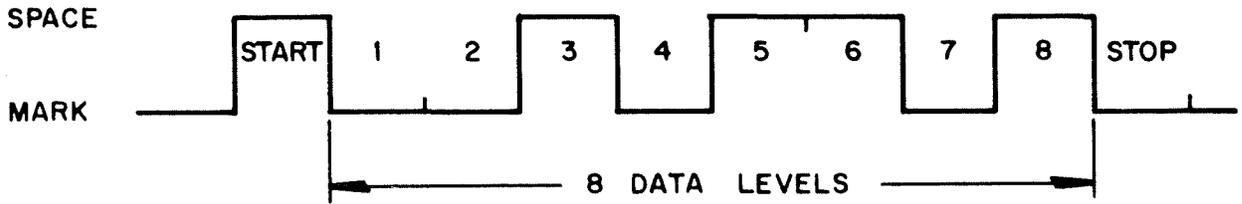
FIGURE 20   SERIAL TRANSMISSION – 5 LEVEL CODE

SPACE

| START | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | STOP |

MARK

5 DATA LEVELS
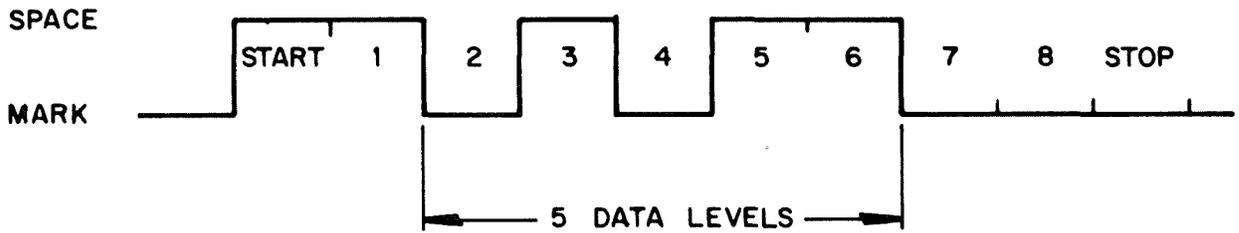
FIGURE 21   PARALLEL TRANSMISSION – ASCII

TIMING

SPACE
DATA 1   MARK

SPACE
DATA 8   MARK

CHARACTER   1   2   3   4   5   6
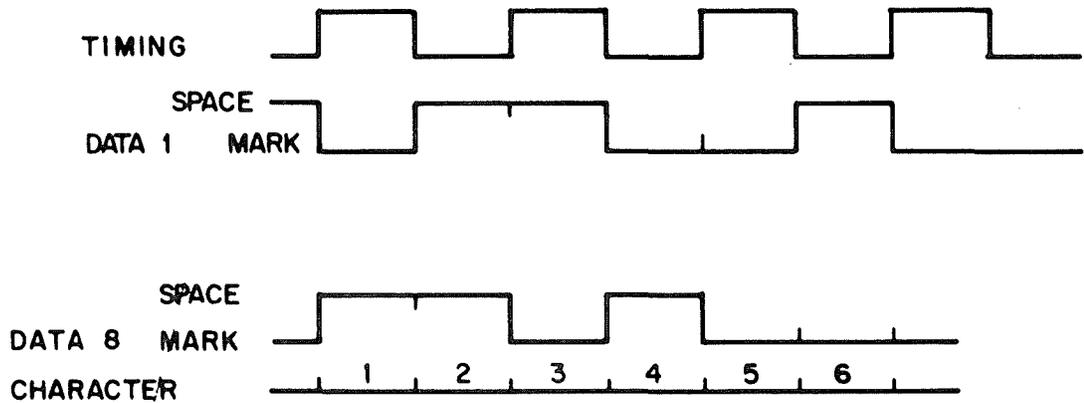
FIGURE 22   PARALLEL TRANSMISSION – 5 LEVEL CODE

TIMING

SPACE
DATA 1   MARK

SPACE
DATA 2 THRU 6   MARK

SPACE
DATA 7 AND 8   MARK

CHARACTER   1   2   3   4   5   6   7   8
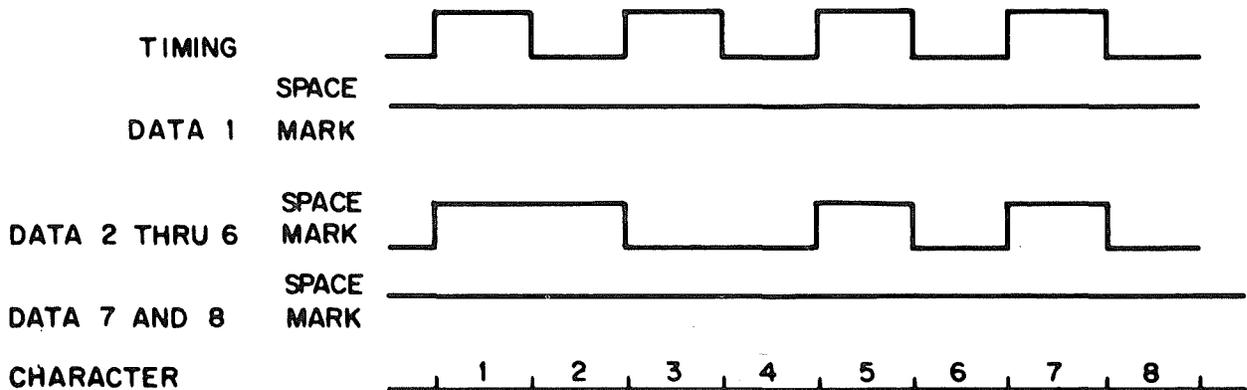
PROCEDURES FOR OBTAINING COPIES OF REFERENCED ARTICLES
AND
ADDITIONAL COPIES OF TECHNICAL REFERENCES

I. Bell System Technical Journals (BSTJ), Institute of Electrical and Electronics Engineers (IEEE), American Institute of Electrical Engineers (AIEE) and most other material from technical journals may be ordered from:

>Engineering Societies Library
>345 East 47th Street
>New York, New York 10017

II. Bell Telephone Laboratories, Inc., "Transmission Systems for Communications," Fourth Edition; and additional Technical References may be obtained in the following manner:

A. IN THE UNITED STATES

1. Bell System Organizations may order these publications using Form SD-1.80.80 and address it to:

>Western Electric Company, Incorporated
>Indiana Publication Center
>P.O. Box 26205
>Indianapolis, Indiana 46226

Order as follows:

(Quantity)—Book—Transmission Systems for Communications, Fourth Edition

(Quantity)—Technical Reference—(Complete Title)

2. Departments of the U.S. Government may purchase these publications from:

>Western Electric Company, Incorporated
>Defense Activities
>Manager—Government Communications
>Contracting
>83 Maiden Lane
>New York, New York 10038

3. All other companies in the United States (non-Bell System) may purchase these publications from:

>Western Electric Company, Incorporated
>Commercial Relations
>P.O. Box 1579
>Newark, New Jersey 07102

B. IN CANADA

1. Bell Canada and all other companies may purchase "Transmission Systems for Communications," Fourth Edition from:

   Western Electric Company, Incorporated
   Commercial Relations
   P.O. Box 1579
   Newark, New Jersey 07102
   U.S.A.

2. Technical References may be obtained from:

   Bell Canada
   Staff Engineer — Data Equipment Design
   1050 Beaver Hall Hill
   Montreal, Quebec
   Canada

C. IN ALL COUNTRIES OUTSIDE THE UNITED STATES AND CANADA

1. These publications may be purchased from:

   Western Electric Company, Incorporated
   Commercial Relations
   P.O. Box 1579
   Newark, New Jersey 07102
   U.S.A.